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THESIS

DEVELOPING A CORE COMPETENCY MODEL FOR INFORMATION SYSTEMS MANAGEMENT OFFICERS IN THE UNITED STATES ARMY

by

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and
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June 2000

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DEVELOPING A CORE COMPETENCY MODEL FOR INFORMATION SYSTEMS MANAGEMENT OFFICERS IN THE U. S. ARMY

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ABSTRACT

As DoD and the Army move into the 21st Century, the technologies that abound are increasing not only volume but also in complexity. In order to manage and leverage these technologies, a clear vision needs to be articulated starting at the very top of DoD. With this vision, it will then become the responsibility of the Army's System Automation Officers (FA 53) to implement that vision. The challenge then becomes, what exactly are the core competencies, or more plainly put, what knowledge, skills and attributes must these officers possess, in order to be successful in carrying out the Army's overarching plans. Once these competencies are identified, how do we ensure our officers' success by training them in these competencies in Army and civilian institutions? This thesis examines these questions and, through use of core competency modeling (specifically, the Customized Generic Model Method), will identify the core competencies of a systems automation officer and explore avenues to improve the efficiency of the FA 53 education.

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ACKNOWLEDGMENT

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I. INTRODUCTION

> Information technology is expected to make a thousand fold advance over the next 20 years. In fact, the pace of development is so great that it renders our current materiel management and acquisition system inadequate. Developments in information technology will continue to revolutionize how nations, organizations, and people interact. The rapid diffusion of information, enabled by these technological advances, challenges the relevance of traditional organizational and management principles. The military implications of new organizational sciences that examine intermittent, nonhierarchical versus hierarchical management models are yet to be fully understood. Clearly, Information Age technology, and the management ideas it fosters, will greatly influence military operations in two areas; one evolutionary, the other revolutionary; one we understand, one with which we are just beginning to experiment. Together, they represent two phenomena at work in winning what has been described as the information war; a war that has been fought by commanders throughout history. (TRADOC Pam 525-5, 1994)

A. THE PROBLEM DEFINED

1. The Problem

The Army's system automation management officer (functional area 53) will take the point for the technology challenges discussed in TRADOC Pamphlet 525-5. That stated, the issue now arises in tomorrow's technology based military, is what competencies, those knowledge, skills and attributes, must a FA 53 officer possess to excel at his or her job? The closest list of competencies the System Administrator has is described in DA Pamphlet 600-3 (Appendix A), Commissioned Officer Development and Career Management. It is, however, more of a general job description than a core group of competencies.

2. Proposed Solution

This thesis proposes a solution to this problem in the form of a system automation management officer competency model. The competency model process takes a comprehensive view of the position, the people needed to fill it, and the competencies that a FA 53 officer must obtain in order to excel at his duties. The competencies will be decomposed into the knowledge, skills and attributes that the officer can focus on in order to prepare him for the role. In addition, the competency data will allow personnel and training managers to ensure that they are creating programs that will succeed.

3. What May Happen If The Problem Is Not Solved

Although the FA 53 community has been around for some time and so far as survived without a competency model, information technology has never been as important as it is today. Current DoD publications that focus on the future force reveal what a strategic asset information technology will become in the next 20 years. Without a system automation management competency model, the Army will never be able to effectively train and assess their FA 53 officers for their duties and ensure their success on the job. Their supervisors will not know how to employ their skills and end up making ineffective use of their time. And finally, you will not be modeling the very best system automation officers that will make the entire functional area less credible. The end result of all this could, in the worst-case scenario, lead to the position being "civilianized" (contract or GS positions) resulting in several obvious concerns about control of advanced technology and the readiness of the Army.

B. BACKGROUND

The Army of tomorrow is built on technology. Unfortunately with the end of the cold war, the world has gotten a little bit bigger for the U.S. Armed Forces and the U.S. Army in particular. Since 1989, forces have been cut in half while deployments have increased from one every 4 years to one every 14 months (Army Posture Statement, 2000). Where once there were two superpowers each policing their hemisphere, now you have one (the United States) policing the whole thing. And to top it off, we are doing this in a period of technological change that is unmatched since the industrial revolution. The information revolution brings bits that are valued over bullets, and bandwidth that is more important than terrain width. In order to meet this revolution and harvest this technology, the U.S. Army has developed a plan to bring the entire organization into the next century in warfighting technologies. This plan is called Force XXI and is the Army's blueprint to modernize, using tomorrow's technology, the force for the twenty-first century. No one knows what the actual Force XXI force will resemble, but experiments, tests and procurement are underway. We have seen some of what is possible with a digitized force whose soldiers will have unprecedented access to information, real-time information that will give them the upper hand on the 21st-century battlefield. Individual soldiers will have helmet-mounted displays that will put computerized battle or map information gathered via satellite or radio in front of their eyes. Computer screens in tanks, helicopters and command posts will display the position of each vehicle or aircraft, allowing them to recognize each other and potential targets, immediate access to information, and the ability to make decisions faster. All of these things are being worked on now to make that twenty-first century force the most information dominant,

most lethal force the world has ever seen. So who is going to set this and manage this system? Who is going to make it interconnect? Who is going to troubleshoot it? In the Army, that job belongs to the Functional Area (FA) 53 officer, the system automation management officer.

To begin the background on system automation officers, we need to understand the process a 53 officer goes through before tackling the military's technology problems. The development of all U.S. Army officers follows a pretty standard track up until their twelfth year of service.

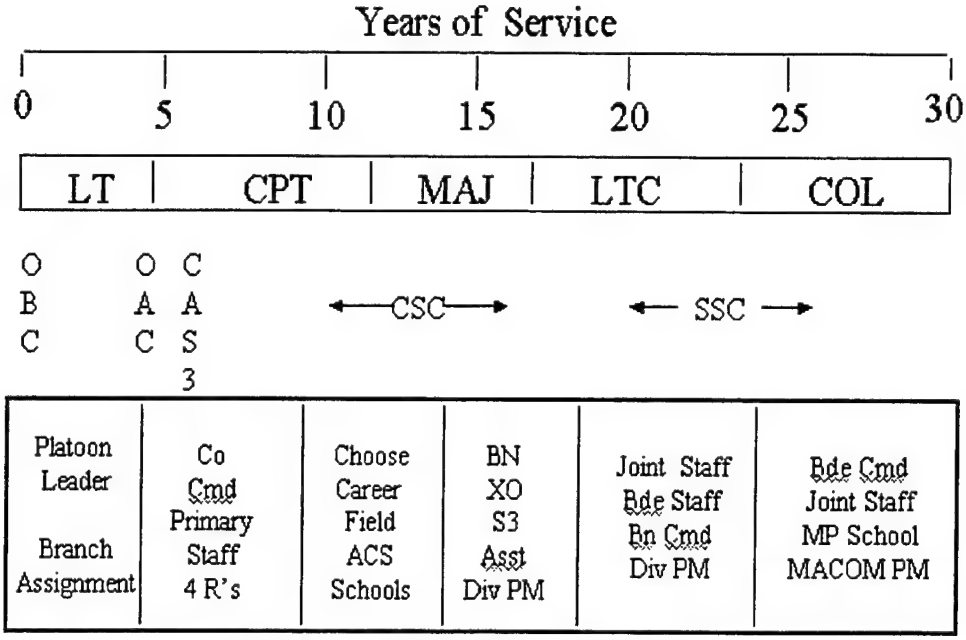

Figure 1.1 Officer Career Timeline

As you can see from Figure 1.1 an officer comes on active duty, goes to his or her basic branch (e.g., Infantry, Aviation, etc) school, and then on to an assignment for roughly four years. At this point, the officer attends his branch advanced course, Combined Arms and Services Staff School (CAS3) and then on to an assignment. This is

usually the assignment where he or she will command a company or the equivalent. From this assignment the officer will then serve in a functional area (e.g. Comptroller, Foreign Area Officer, System Automation, etc.) or do one of what is referred to as the three R's (Recruiting, ROTC, or Reserve Component Advisor). It is this assignment after company command that is the focus of this thesis. More specifically, the assignment as a Functional Area 53, the Army's system automation officer

Currently, if an officer is selected to be in the functional area 53 field, he or she can expect to be trained one of two ways. Initially, an officer needs to make the decision to be considered for Advanced Civil Schooling (ACS). Usually this doesn't take long since most functional area branch managers will tell you that it is easily the most asked question that they hear; "What are my chances for ACS?" A lot of officers use it as a key evaluation criterion when choosing their functional area. But before they can be considered to attend graduate school, the officer must meet the Army's requirements. For an officer to be eligible for selection to graduate school he or she must:

1. Be competitive for promotion
2. Undergraduate GPA of greater than 2.5
3. GMAT 500 or higher or GRE 500 or higher in each category
4. Fewer than 17 years of Active Federal Service
5. Completed CAS3

Obviously, the requirements are not impossible to meet, but the Army only has so many Advanced Civil Schooling slots available. For fiscal year (FY) 2000 there are 412 ACS slots, of which roughly 9 will go to FA 53 officers. Not a significant amount of the overall distribution. Once selected, these officers can then attend the graduate school of

their choice. However, the Army has an established relationship with several graduate schools and recommends that these selected officers attend one of those graduate schools. These schools all have proven academic track records and most grant Army students "in-state" tuition to keep taxpayer costs low. An officer who does not attend one of these graduate schools is the exception and not the rule. The remainder of these officers, who were not selected for graduate school, will attend the System Automation Course (SAC) in Ft. Gordon, Georgia. The SAC course is a 20-week course that trains students to perform those duties and responsibilities outlined in DA Pam 600-3. There are seven SAC classes taught each year at Ft. Gordon. For FY 2000, there are roughly 12 active duty students per SAC class or roughly 100 for the year. So 10% will attend ACS while the remainder will go to the SAC. The course trains students on the following topics for the listed durations:

Topic	*Days*	*Topic*	*Days*
Computer Hardware	3	TCP/IP	3
Operating Systems	3	Routers	4
System Analysis and Design	5	IP Management	3
Database Design	9	NT Enterprise	5
Programming	20	Messaging	2
Web Concepts	11	Solaris Administration	5
Networking Essentials	5	Network System Security	8
NT Server 4.0	6	Project	5

Figure 1.2 Systems Automation Course Curriculum

Another important point is that this is a standard curriculum receives an annual review and minor adjustments to keep up to date with current technology. The question that arises as to how curriculum is linked to the competencies a FA 53 must have to

succeed on the job if the competencies don't exist. Graduate students face a similar problem under different circumstances. When the FA 53 officer is sent off to the chosen school, the Army sends him or her off with a pat on the pack, a paycheck, and free tuition (for the officer, not the government). The thing that they don't send them off with is guidance. Guidance in the form of what knowledge, skills and attributes one should possess in order to be successful in a position as a system automation manager. This issue is central to the problem. If the Army is leaving the curriculum up to each of the individual universities then the following questions arise:

a.) Is there consistency in the graduates' level of performance after graduation?

b.) Are the universities training officers in those competencies they need to have to succeed?

This past year, the government has tackled this same type of issue with the CIO University concept. The Chief Information Officers Council and the General Services Administration (GSA) selected four universities (George Washington, Carnegie Mellon, George Mason, and University of Maryland) in the Washington D.C. area to participate in the CIO University program. The university will consist of "institutions of higher learning offering curricula based on the established federal CIO core competencies" (Dorobek, 1999). GSA formed a series of focus groups that created a 66 page document of learning objectives that eventually led to the agreed upon ten core competencies (Dorobek, 1999). Each of the universities selected will construct programs that will meet the council's learning objectives.

This is an example of how the Army can meet training objectives and ensure a standard education, even though there are several participating universities. Why doesn't the FA 53 community follow the CIO lead?

C. OBJECTIVE AND RESEARCH QUESTIONS

The primary objective of this research is to create a competency model for the U.S. Army's Information Technology Management officers. Its secondary objective considers the use of the competency model. More specifically, what do you use the competency model for once it is created? The following research questions address these primary and secondary objectives.

1. What exactly are the core competencies of the Army's System Automation Officer (Functional Area 53)?

The Army has two basic training strategies for its FA 53 officers: one being Advanced Civil Schooling, and the other being the Systems Automation Course. The SAC curriculum has been derived through the Army's Training and Doctrine Systems Approach to Training process of identifying the tasks needing to be performed by a FA 53 officer (creating a skill set), performing a task analysis of each of those tasks, then creating a Program of Instruction (POI) based on those tasks. It's a standard development process that is used Army wide. However, this process does not take into account what is being taught to the 10% of those FA 53 officers in graduate school. We realize the main educational effort should be focused on where the majority of our officers are trained; yet we cannot ignore the ACS segment. A set of core competencies for the FA 53 officer cannot be valid without considering both the ACS and the SAC curriculums.

2. Using the core competency model, what are the courses that should be taught in the SAC course and in graduate school which cover all core competencies of the System Automation Management Officer?

Developing the FA 53's core competencies is only half the battle. Once those competencies are identified, then one can have a good idea what knowledge, skills and attributes the System Automation Manager should possess. However, this information may only be useful if they were placing an ad in the classifieds One of the main problems identified in this thesis is what do you do with that information after you have it. What classes or courses must be created in order to support those competencies? The competencies have to exist to determine the training needs, but are not meant to be just a list. However, it is only after we develop the competency model that we have the information that we can use to analyze the differences in Army based education and civilian graduate education, and hopefully come up with the right mix of the two that will optimize the education of U.S. Army FA 53 officers.

3. How can the Army's FA 53 education system be improved to increase the overall level of education these officers receive?

The Army's education system for System Automation Management Officers is not broken. Some would say, "if it aint broke, don't fix it". We are more in the mind set of "If it aint broke, make it better!" This is a primary belief that sits at the heart of the research. Answering the first two questions will be the catalyst, which will provide the information to make recommendations on how to improve the current system of educating FA 53 officers.

D. METHODOLOGY AND LITERATURE REVIEW

The methodology is a combination of competency modeling and data research to create the FA 53 officer's core competencies. For the purpose of this thesis we used the

Customized Generic Model Method which uses a tentative list of competencies identified internally to aid in the selection of a generic model which will then be validated with the input of outstanding and average performers (Dubois, 1993, pp. 91-95). The generic model that we chose was the managerial competency model. This competency model was created by analyzing different models created by the Job Competency Assessment (JCA) method (Spencer, 1993, p. 199). This particular model was chosen for its underlying methodology, its comprehensive nature and its analysis of military managers.

E. EXPECTED BENEFITS OF THIS THESIS

This benefit of this thesis is two fold. The first benefit is the development of the competency model itself. This model should provide the FA 53 officer an all-encompassing list of competencies that he should possess. This list could guide the officer's education efforts whether attending graduate school, SAC or throughout his career during his continuing education efforts. The second, benefit is aimed at the system which educates the FA 53 officer. The educational system is not bad, nor is it producing officers who cannot perform their jobs. However, there is room for improvement in almost everything, and this portion of the Army is no exception. Our recommendations and conclusions in this area will address possible benefits in utilizing the competency model in personnel and education systems designed for the system automation officer.

II. LITERATURE REVIEW

The literature review will cover several topics that have direct relevance to our research. The first is a review of the Army's Training and Doctrine Command's (TRADOC) training development process. It is imperative that the reader be well versed in the process, as we will utilize products from the SAC course, developed through this process, to build our competency model. The next three areas of the literature review are closely related. These areas begin with an examination of the Clinger-Cohen Act of 1996. It is this act that brought attention to, through legislation, information technology in government. It was also this act that created the need for a CIO University that eventually produced a list of core competencies that a chief information officer should possess. Lastly, this review will cover all the current literature concerning core competency models and their creation. Addressing the competency model literature is the final piece of the review, which will lead to data collection and analysis necessary to produce the system automation manager core competency model.

A. TRADOC TRAINING DEVELOPMENT MODEL

The Training and Doctrine Command (TRADOC) is responsible for training soldiers in the Army. Because the Army's peacetime mission is to be trained and ready to fight, TRADOC has critically important job. The mission and vision of TRADOC is:

TRADOC Mission

Access the Force
Train the Army for War
Set the Army's Standards and Requirements
Command Assigned Activities and Installations

TRADOC VISION

To prepare the Army for Decisive Victory in the Full Range of Required Joint and Coalition Operations through:

•Accessing and Training the Army's Soldiers and Leaders and Providing Disciplined Combined Arms Training Environments for Units
•Balanced Development of Concepts, Requirements, and Products in Doctrine, Training, Leadership, Organizations, Material, and Soldiers
•Providing Readiness Infrastructure for Training and Projecting Army Forces
•Building a Command Environment that Promotes Safe, Values-Based and Disciplined Operations

Figure 2.1 TRADOC Mission and Vision

As represented in their mission statement, TRADOC has the responsibility for all Army schools and the education and training of all Army soldiers. The System Automation Course at Ft. Gordon, Georgia is a TRADOC post. Being a TRADOC asset, all of Ft. Gordon's schools and courses are governed by various TRADOC pamphlets, regulations and guidance. TRADOC's main training regulation is TRADOC Regulation (TR) 350-70. It covers everything from training management to quality assurance to training implementation. The sections most pertinent to this study are individual training development and training course development. By examining these two areas, one can understand how the SAC course was developed and how it has evolved into what is taught today.

1. TR 350-70 Introduction

By any description, TR 350-70 is a very large document. The Army's mission is training, so perceivably the document that covers all the information relating to training

has to be pretty sizeable. The Army uses TR 350-70 to communicate their training development approach; the Army calls it the Systems Approach to Training or SAT. The Army strives to standardize everything, and training is no different, as the SAT process must be employed Army wide as the training development process. "The goal of the SAT process is to support the Army's mission by providing mission-focused, task-based training/education. This training must be rigorous; relevant to units, soldiers and leaders being trained; and conducive to safety and environmental protection" (TR 350-70). The SAT is a systematic, spiral approach to making collective, individual, and self-development training decisions for the total Army. It is a five-phase process, but the phases do not have to be followed in order. This allows SAT to be in continuous development with ongoing revisions and implementations:

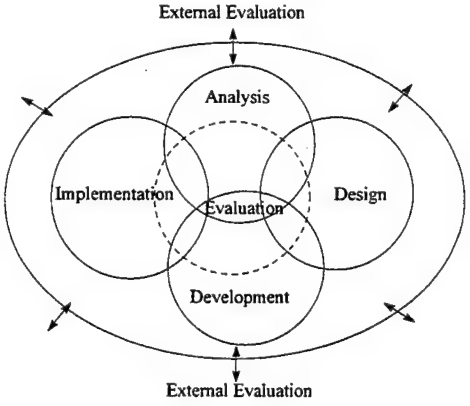

Figure 2.2 The SAT Process

Each phase is designed to accomplish something specific within the training development process. The phases are outlined briefly below:

Phase	***Description***
Evaluation	Determines how well the training takes place, Army personnel/units perform, and products support training
Analysis	Identifies: Need for training, Who gets the training, What tasks are

	critical. Also identifies supporting skills and knowledge for the critical tasks.
Design	Determines: When, Where and How the training will take place. Training resource requirements (e.g. Instructors, Equipment, Facilities)
Development	Produces validated training/training products
Implementation	Is the training/course start date: It Executes: Standardized training at training site, distribution of training products, and Use of training products.

Figure 2.3 SAT Phase Descriptions

The two areas most important to this study are individual training development and training course development. These are two sub-areas of the SAT and are represented in the Analysis and the Development phases respectively.

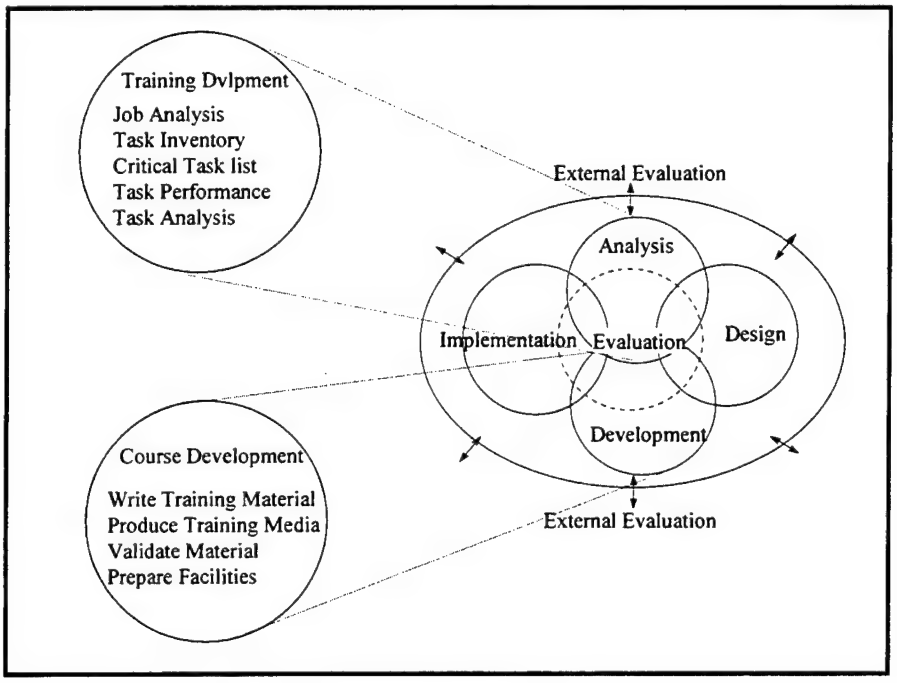

Figure 2.4 SAT Breakout

2. Individual Training Development

According to Slaughter (1998), the task is the "atom" of the work universe. (Slaughter, 1998, p. 1) Slaughter was making the point that the task is the building block, the smallest element of every job in the work place, just as the atom is the fundamental building block of all things in this world. The Army has a similar view of the task when it comes to training. In TR 350-70, everything starts with the task, the building block. TRADOC begins the process with Job Analysis (JA). Job Analysis is the process used to identify individual tasks that are critical to job performance that a job incumbent must perform to successfully accomplish his/her mission (TR 350-70). Job Analysis is the crucial first step in the training development process. It is a nine-step process that begins with job identification and ends with a critical task list.

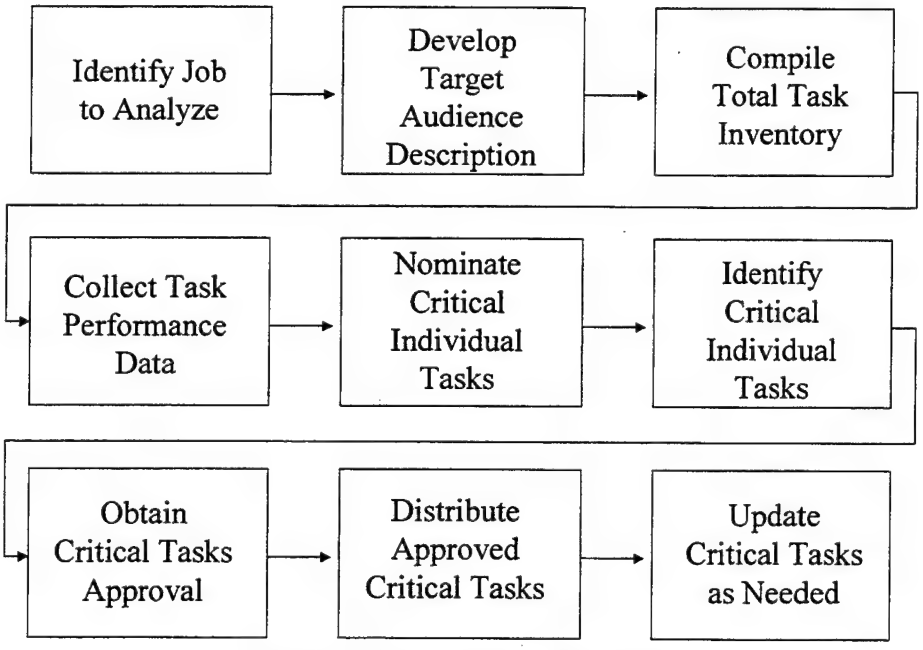

Figure 2.5 Job Analysis Process

To begin the job analysis process there must be an approved training development (TD) requirement for the JA. The target audience is then described where categories

such as knowledge level, ASVAB test scores, and reading grade levels are considered. With this information, tasks are compiled from references, mission analysis, and subject matter expert (SME) interviews. It is then determined which tasks are indeed 'critical'. Surveying experts and users in the field normally do this. A task selection board, consisting of SMEs, nominates and identifies the critical tasks. Finally, the task list is sent to the proponent for approval, and the approved list is distributed. The flow diagram identifies job analysis as the third block. The first two parts of the flow diagram are involved with the need or requirements for the job. These sections were left out of the discussion as they are outside of the scope of this thesis.

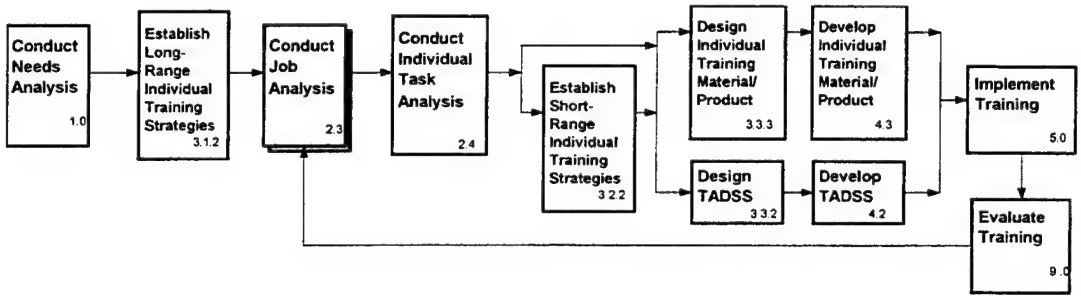

Figure 2.6 Flow Diagram

The main resource that is produced from job analysis is the critical task list. The critical task list is, like its name implies, a list of tasks. These tasks are not described nor do they have performance measures associated with them. That job is left for the task analysis phase. Task analysis presents a list of critical tasks. The critical individual task analysis is the process used to identify how the task is actually performed, under what conditions it is performed on the job, and how well the individual must perform it. It provides the detail to design and develop efficient and effective individual training (TR 350-70). Task analysis is a seven-step process:

Steps	Activities
(1) Identify individual task performance specifications	(a) Review the task title. (b) Develop the task condition statement. (c) Identify and list all individual task performance steps in performance sequence order. (d) For each task performance step, identify the Skills and knowledge required to perform the step. (e) Develop an objective task standard that measures task performance. (f) Establish performance measures. (g) Identify supported individual tasks. (h) Determine if specific certification is required for task performance.
(2) Assign a permanent individual task number	Follow critical individual task numbering guidance.
(3) Prepare the individual to-collective task matrix	(a) Identify supported collective tasks. (b) Link this individual task to all supported collective tasks.
(4) Develop a task-to-skill/knowledge matrix	Develop on an "as needed" basis. It is valuable for comparing task content and for structuring and sequencing training.
(5) Obtain individual task analysis approval	Obtain approval from appropriate command authority for new and revised task analysis.
(6) Distribute approved individual task analysis	Distribute the approved task analysis data to the appropriate organizations for use in designing and developing training and training products.
(7) Update individual task analysis	Keep task performance specifications current.

Figure 2.7 Task Analysis Steps

The bulk of task analysis occurs in the beginning of the process. Step 1 begins by identifying the task performance specifications. This provides the soldiers with directives as to how they are to do the task (step by step), where they are expected to do the task (the conditions), what skills and knowledge are required to perform the task, and lastly how they are evaluated when executing the task. From there, the task is assigned a task number to make it official. It is then entered into two matrixes that identify the supported collective tasks and the prerequisite skills and knowledge the soldier must have before attempting the task. Finally, the proponent approves the task analysis and the task

is distributed as 'approved'. The individual task analysis is then complete when all individual task performance specifications and supporting and supported critical individual tasks have been identified (TR 350-70). Once the individual tasks consist of tasks, conditions, and standards, the process moves from the analysis phase to the design and development phases. This begins the creation of the course that will eventually train these tasks.

3. Training Course Design and Development

Training course design and development are the steps necessary to construct a course from the tasks that have been developed from the job analysis. At this point the identified task are simply abstracts and ideals. The course design and development stages will give these descriptions form and function.

Training course design begins once short-term training design strategies have determined the need for a training course. Specifically, TR 350-70 describes course design as:

Course design translates critical task analysis data into sequential, progressive training. Course design:

1. Is the process used to determine the optimum training strategy for each individual critical task and supporting skills and knowledge?
2. Is the process used to translate each individual critical task and supporting skills and knowledge into learning objectives?
3. Ensures the overall efficiency and effectiveness of the total training program/system.
4. Identifies all resource requirements.
5. Establishes:
    a. How (media/method), when and where training is conducted
    b. Training structure (courses, phases, annexes, lessons, etc)
    c. Unit/student tests

d. Mandatory training sequence
e. Graduation requirements

Following this outline, the designer will meet the requirements of this phase. The course designer must incorporate all tasks included in training in order to build a framework that will 'house' the training. Prior to moving into course development, which is the execution portion of design, the designer must have met the required course design exit gates:

1. A designed course, consisting of:
   a. Mandatory training sequence
   b. Training course length
   c. Lesson outlines
   d. Training resource requirements
   e. Student evaluation plan
   f. Course map
   g. Test items/test design
   h. Scripts and storyboards (as appropriate)
2. Course Management Plan (CMP)
3. Compiled Program of Instruction (POI)
4. Course Administrative Data (CAD)

Training course design now becomes the blueprint for the course that will be constructed. Training course development is the brick and mortar that actually provides the substance to the design. TR 350-70 lays out the purpose and goals of training course development:

Course development is the process used to convert the course design into the training products and materials required to implement the course. The lesson outline is the building block for all training. It may be completed as a lesson plan for formal

institutional training or as a lesson in a correspondence course or distance-learning product. A training course consists of:

1. Common/Shared Task TSPs
2. Lessons (instructor, self paced, etc)
3. Tests
4. Student Handouts
5. Supporting Products (video tapes, photos, articles, etc)

To finalize training course development, there are several minimum essential requirements that must be completed, namely:

1. Validated, approved training courses and material, such as:
   a. TSPs
   b. Detailed lessons and lesson plans
   c. Final, ready to use media products
   d. Criterion referenced performance tests
   e. Practical exercise assignment sheets
   f. Home study assignment sheets
   g. Study guides
   h. Student workbooks
   i. Information sheets
2. Validated, approved sub courses or correspondence courses
3. Trained instructors in instructional and implementation procedures as appropriate to method of instruction and media

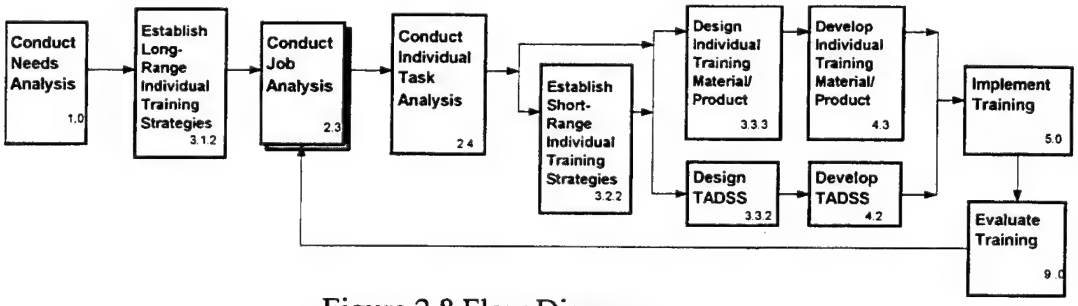

Figure 2.8 Flow Diagram

Figure 2.8 shows the relationship of design and development to other phases. Once these final two portions of the SAT process are completed, the course is ready to be implemented.

The SAT process walks through the steps of discovering a training need, identifying a job analysis that will fulfill that need, developing a task analysis that will identify and describe the skills needed for that job, and finally to providing a course that will teach those skills for that job that the Army has identified. This process is a detailed and complete developmental schema that ensures that Army trainers will analyze and develop top-notch training products to ensure the force is trained and ready.

B. Clinger-Cohen Act of 1996

The Clinger-Cohen Act of 1996 was previously called the Information Technology Management Reform Act or ITMRA. The intent of the Act is to improve government performance through the effective application of information technology. The importance of the act was two fold. First, the act put information technology in the forefront of every government agency. Second, it caused the government to be introduced to core competencies through the creation of an agency chief information officer (CIO). The ITMRA can be broken up into two main areas, effective use and acquisition of IT assets and establishment of the CIO position.

1. Use and Acquisition of Information Technology Assets

The primary purposes of the bill were to streamline IT acquisitions and emphasize life cycle management of IT as a capital investment (ITMRA Summary, 1996). The first step of the bill was to decentralize the acquisition of IT assets to all government agencies.

IT had become too commonplace to continue with a centralized procurement system. The bill did not demand, but encouraged incremental acquisitions of IT resources and the acquisition of commercial off the shelf (COTS) IT products. To further this point, the bill allowed the Administrator for Federal Procurement Policy to conduct pilot programs in several federal agencies to test alternative approaches for acquisition of IT resources. In addition, Clinger-Cohen saw and valued the potential strategic value of information technology. To this end, they required agency heads to:

- Design and implement an IT management process for maximizing the value and assessing and managing the risks of IT acquisition

- Integrate the IT management process with the process for making budget, financial, and program management decisions

- Establish goals for improving the efficiency and effectiveness of agency operations and, as appropriate, the delivery of services to the public through the effective use of IT, and prepare an annual report, to be included in the executive agencies budget submission to Congress, on the progress in achieving the goals

- Ensure that performance measures are prescribed for IT by or to be acquired for, the agency and that they measure how well the IT supports agency programs

- Ensure that the information security policies, procedures, and practices of the agency are adequate

The Clinger-Cohen Act was clearly attempting to put IT management in the forefront of the minds of agency heads. The author's understood their audience as the act's language moved from the 'nice idea' suggestions to the 'will comply' directives. This type of legislation was clearly necessary since, for a time, the government faced

being left behind with respect to technology. With no profit motive to drive senior government leaders, of which many had no technology training or exposure, IT was continually a second thought. Clinger-Cohen decided to solve this problem with the creation of a CIO position.

2. Establishment of the CIO Position

Establishing a CIO position for all government agencies might have seemed a bit unnecessary in 1996. The idea of CIO position back then was just being adopted by industry, and for the government to require each of its agencies to have a CIO was somewhat cutting edge. With its establishment, the Clinger-Cohen Act produced some guidance about what they wanted to see in a CIO. The ITRMA summary outlines their duties and responsibilities:

> The duties and qualifications of the CIO of an agency shall--
>
> (1) have information resources management duties as that official's primary duty;
> (2) monitor the performance of information technology programs of the agency, evaluate the performance of those programs on the basis of the applicable performance measurements, and advise the head of the agency regarding whether to continue, modify, or terminate a program or project; and
> (3) annually, as part of the strategic planning and performance evaluation process
>
> (A) assess the requirements established for agency personnel regarding knowledge and skill in information resources management and the adequacy of such requirements for facilitating the achievement of the performance goals established for information resources management;
>
> (B) assess the extent to which the positions and personnel at the executive level of the agency and the positions and personnel at management level of the agency below the executive level meet those requirements;
>
> (C) in order to rectify any deficiency in meeting those requirements, develop strategies and specific plans for hiring, training, and professional development; and

(D) report to the head of the agency on the progress made in improving information resources management capability.

Although they did not leave agency heads completely in the dark about the CIOs role and job description, the Clinger-Cohen Act probably raised more questions than it answered about the CIO position.

C. CIO UNIVERSITY

1. Background

The CIO university concept was a direct result of the 1996 Clinger-Cohen Act (CCA). In the CCA, one of the provisions required that government agencies appoint a Chief Information Officer or CIO. By examining the CCA and the Paperwork Reduction Act of 1995, one can identify a number of characteristics that are key to effective management of agency wide information resources (GAO Report on CIO, 1996):

A. An agency should place its CIO at a senior management level, making the CIO an equal partner with other senior officials in decision-making with regard to IRM issues, and supporting the position within effective organizational framework for leading agency wide IRM initiatives. Specifically, agencies should:

1. Appoint a CIO with expertise and practical experience in information and technology management; position the CIO as a senior management partner reporting directly to the agency had;
2. Ensure that the CIO is primarily responsible for IRM activities;
3. Task the CIO to serve as a bridge between top management, line management, and information management support professionals;

4. Establish a deputy CIO at the agency level & other CIOs as necessary in major organizational sub components to represent their IRM interest; and
5. Develop strategies and specific plans for hiring, training, and professional development of personnel to achieve a highly qualified IRM workforce.

B. The CIO should be supported with effective management controls, including:

1. A sound and integrated information technology architecture to provide a framework for involving or maintaining existing information technology and for acquiring new information technology to achieve the agency strategic and IRM goals;
2. An inventory of all agency information resources to facilitate management of these resources in support decision-making concerning additional investments;
3. Management systems and procedures to ensure, in conjunction with the chief financial officer or, a full and accurate account of information technology resources and related expenses;
4. Appropriate IRM policies, guidelines, and standards and a means of insuring agency wide compliance with an effective implementation of them; and
5. A means of assessing in upgrading the skills of all agency personnel with regard to IRM

C. The CIO should be responsible for working with other agency officials to ensure the effective acquisition and management of information resources to support agency programs admissions. This includes

1. Promoting effective agency operations by implementing budget link capital planning for information technology investments to support the agency strategic plan;
2. Actively participating with other agency managers in IT planning, budgeting, and investment decision-making;
3. Promoting improvements in agency administration and mission related work processes before making significant IT estimates;

where possible, the agency head has to ensure that agency work process performance is quantitatively benchmarked and analyzed against comparable processes in the public or private sector before revisions or significant IT investments are made.

4. Developing performance indicators to measure the extent to which information resource investments support agency programs and missions; and monitoring the performance of agency IT programs, evaluating them on the basis of applicable performance measures, and advising the agency head regarding whether to continue, modify, or terminate individual programs or projects.

The responsibilities laid out above were a tall order to say the least. The era of the personal computer and network architectures were just beginning to emerge. Personnel who could meet that job description were scarce. The government realized it needed a training plan and the CIO University concept was born. The Chief Information Officers Council and the General Services Administration (GSA) were tasked with creating the university. According to the IT work force committee, the university would consist of "institutions of higher learning offering curricula based on the established federal CIO core competencies, and geared to those in government and industry holding and aspiring to the highest management positions," (Dorobek, 1999, p. 2). One of the most significant tasks the council faced was flushing out what the core competencies were. "If you asked people what the competencies were, you'd get different answers" (Dorobek, 1999, p. 3). So GSA formed several focus groups that included nearly 100 people from government, industry and academia that created a 66-page document of learning objectives. The document led the group to establish the CIO core competencies and the creation of the classes that would support them:

Policy and Organization	Project and Program Management
Leadership and Managerial Skills	Capital Planning and Investment Assessment
Process and Change Management	Acquisition
Information Resources Strategy/Planning	Technical Skills
IT Performance Assessment	Desktop Technology Knowledge

Figure 2.9 CIO Core Competencies

2. Process

The CIO University concept was indeed a necessary and revolutionary idea. The significance to this thesis however, is not just its fruition or implementation, but the process that was taken to achieve it. The need for a CIO in government was recognized even before some civilian businesses realized it. From this vision, the ITWFC set down a plan to help the government meet its demands for an adequately trained IT work force. The direction to create the position in 1995 to implementation of an education structure in 1999 shows a small bit of government efficiency and civilian-government cooperation. According to the CIO University learning objectives document, the CIO council conducted a series of focus groups for each of the major competency areas. In total, there were 100 SMEs from the federal government, educational institutions and industry. The SMEs participated in the sessions, which were facilitated by experts in group process and learning theory. The vigorous exchanges which ensued during the sessions resulted in a mutually agreed upon set of learning objectives (LO). The learning objectives and key critical commentary were then summarized and sent to the participants. The participants were asked to review their perspective focus group areas, seek feedback from their colleagues, and respond with comments to GSA. A panel of people with varied backgrounds in technology, graduate education, and federal management scrutinized their

comments. Revisions were then made to the learning objectives as appropriate. The resulting document, The Learning Objectives of the CIO University, is an important product of the CIO Council for two reasons. First, it clearly delineates the Core Competencies and Learning Objectives that form the basis for evaluating and selecting responses from universities seeking to be part of the CIO University. Second, and more importantly, it defines the Federal government's requirements for IT executive development (CIO LO document).

This document was submitted along with the request for proposal to select the participating universities.

3. Execution

From the proposals that were received, four universities were selected as CIO University participants: Carnegie Mellon University, George Mason University, George Washington University, and University of Maryland. All universities will offer classes in the Washington D.C. area. The program is designed to develop current and future CIO's with busy schedules. "There's a lot of education and training out there," said Agriculture Department deputy CIO Ira Hobbs, co-chairman of the IT Work Force Committee (ITWFC). However, according to Hobbs, most of the training was not been designed around the core competencies as detailed in ITMRA (Dorobek, 1999, p. 1). Each university was able to institute their respective programs as they wish, but most utilized existing courses to cover the CIO University objectives. Cynthia Shoemaker, a staff member at George Washington University's Office of academic development and continuing education, reports several of the core competencies match university

programs. Andres Fortino, director of the technology management graduate program at George Mason University's School of Management, states about 80 percent of the requirements were met with present courses (Dorobek, 1999, p. 2). The individual universities began their CIO programs at different times with George Washington starting first, but at the present, all universities have their programs implemented with students enrolled.

This CIO University product resembles what we wish to create for the FA 53 community. The process in creating the competency model will be different, but its end uses will be similar to the competencies created for the CIO.

D. CORE COMPETENCIES AND COMPETENCY MODELS

1. Core Competencies

In the 1970's if a business was referred to as a conglomerate, it was a badge of honor. The conglomerate tag described a large corporation that owned and managed several smaller business units that might or might not be interrelated. It was a business that had its hands in everything. Today however, if you call a business a conglomerate you are using a dirty word. A conglomerate today is a corporation whose business is not focused, unwieldy to manage, and whose hierarchy is bloated and unresponsive. Beginning in the late 1980's, businesses have moved away from the "do everything, be everything" mentality and began focusing the majority of their efforts on only a few things that they did well that made them the most money. You began to see companies laying off workers, spinning off divisions, and reinventing themselves. They did this around their new focus on what was called their *core competencies*. Hamilton Strategic

Management Group defines core competencies as, "Core competencies/capabilities are bodies of expertise, organizational skills or systems, which are perceived by the customer as providing exceptional value. They are substantially unique. High performance companies will have clearly understood core competencies, medium to low performers either will not have such competencies, or will fail to recognize and capitalize upon them." To summarize, business core competencies are those things they do best that give them an advantage over the market. This move towards corporate core competencies started another movement within the realms of business. That is taking the competency idea several layers deep past the business focus into the human resource (HR) arena by developing individual core competencies through competency modeling.

2. Competency Models

Competency models have been around for over 25 years. Two psychologists named David C. McClelland and David Berlew created them in the early 1970's. McClelland, began his study in competency models when a United States Information Agency Official presented him with a challenge - could he identify the attitudes and habits of the most successful USIA officer so that the agency could begin selecting employees on the basis of more relevant criteria than their existing screening tests (Lepsinger, 1999, p. 15)? McClelland's answer was yes, and he sought out to develop the first competency model. Competency models didn't gain popularity right away. It has only been during the last four or five years that competency models have become mainstream in HR departments.

a. What is a Competency?

This question was asked to several hundred participants who attended a management conference in Johannesburg, South Africa. Their response: "A competency is a cluster of related knowledge, skills and attitudes (KSA) that affects a major part of one's job (a role or responsibility), that correlates with performance on the job, that can be measured against well accepted standards, and can be improved via training and development (Parry, 1996, p. 50). G.O. Klemp, offers a simpler definition, "an underlying characteristic of a person which results in effective and/or superior performance on the job (Klemp, 1980, p. 21). Given these definitions, a competency model then describes the particular combination of knowledge, skills and characteristics needed to effectively perform a role in an organization (Lepsinger, 1999, p. 5). With this definition, it may seem simple to establish a set of competencies that allow a person to perform a certain job at a certain level, but that is anything but the truth. A discussion of the process involved in creating a competency model will explain the difficulties involved.

b. The Competency Model

Competency modeling is not only the end product of the competencies, but also the process that gets you there. The end state of the process is to determine a set of competencies for a certain position. There are many methods on the 'how' to get there, but the final outcome is essentially the same, the identification of the behaviors (competencies) required to successfully perform a given role (Lepsinger, 1999, p. 18). There are several current and proven development practices to accomplish this:

The *Job Competence Assessment Method* uses interviews and observation of outstanding and average performers to determine the competencies that differentiate between them in critical incidents (Dubois, 1993, pp. 72-85).

The *Modified Job Competence Assessment Method* also identifies such behavioral differences, but to reduce costs, interviewees provide written account of critical incidents (Dubois, 1993, pp. 85-86).

The *Generic Model Overlay Method* uses an off the shelf generic competency model for a specific role or function (Dubois, 1993, pp. 86-90).

The *Customized Generic Model Method* uses a tentative list of competencies identified internally to aid in their selection of a generic model and then validates it with the input of outstanding and average performers (Dubois, 1993, pp. 91-95).

The *Flexible Job Competency Model Method* seeks to identify the competencies that will be required to perform effectively under different conditions in the future (Dubois, 1993, pp. 98-107).

The *Systems Method* demands reflecting not only on what exemplary performers do now, or what they do overall, but also behaviors that may be important in the future (Linkage, Inc., 1997).

The *Accelerated Competency Systems Method* places the focus on the competencies that specifically support the production of output, such as organizations products, services, or information (Linkage, Inc., 1997).

Out of all these methods, there are two basic approaches to choose from when developing a competency model: a) starting from scratch or b) starting with a validated model. The starting from scratch method is time consuming and expensive, but yields results that are role and company specific. Starting with a validated model saves

time on data collection, validation and analysis, but may not address specific job positions. The two approaches are compared below.

Starting from Scratch	Starting with a Validated Model
Identify performance criteria for individuals and work units	Identify performance criteria for individuals and work units
Identify individuals and work units that meet, exceed and fall below performance criteria	Identify individuals and work units that meet, exceed and fall below performance criteria
Interview job incumbents and informed observers	
Observe job incumbents directly "a day in the life"	
Develop interim competency model – analyze data for themes and patterns and look for differences between exceptional and standard performers	
Utilize data collection method (survey, direct observation, evaluation by others, performance appraisals, records check, simulation) and test the degree of relevance and importance of the competencies to the job	Utilize data collection method (survey, direct observation, evaluation by others, performance appraisals, records check, simulation) and test the degree of relevance and importance of the competencies to the job
Analyze data and refine the model	Analyze data and refine the model
Validate the model: administer a 360 degree questionnaire to identify competencies that correlate with exceptional performers	Validate the model: administer a 360 degree questionnaire to identify competencies that correlate with exceptional performers
Finalize the model	Finalize the model

Figure 2.10 Competency Model Approaches (Lepsinger, 1999, p. 54)

As stated earlier, there are several development practices you can choose from to develop a model. However, for the purpose of this thesis, a generic process will be explored that can be used as a template for the development of the competency model.

To begin the competency modeling process, one must determine where to collect your data. Data can come from any number of sources. Some data will already exist in the form of performance appraisals, job titles, job descriptions, existing

competency models, and preexisting records. Some data you will generate from scratch through observing a person during a day of work or through interviews and surveys. The preferred method for competency models is the interview. This format is most effective for gathering detailed information about the work environment and the competencies demonstrated by the people when carrying out their work (Lepsinger, 1999, p. 70). It is especially important at this point to ensure that the interview subject is that person who epitomizes the role or job. If you are going to create a competency model that maybe used to hire and evaluate personnel, it is important that the interview and survey subjects are the best performers. Marginal and poor performers should be interviewed for comparison purposes, but the focus is on those personnel, who, if you could clone you would. Regardless of the data collection strategy you employ, it is best to use several sources to ensure the validity of the data. As with many forms of behavioral science research, the safest approach is to use two or more data collection methods to crosscheck and validate results (Parry, 1996, p. 52).

Once the necessary data has been collected, it is time to analyze it and develop an interim competency model. This step involves examining the raw data collected during your data gathering process. The data is analyzed to identify themes and patterns that emerge to identify relevant competencies (Lepsinger, 1999, p. 80). The data gathered on high performers is also compared to that of his/her marginal peers to identify the differences between high and low performers. This step is probably the most difficult in the process. The data exists, and somewhere inside are the competencies that need to be drawn out. Scott B. Parry, Chairman of Training House, a HR consulting firm in

Princeton, NJ, lists 12 universal guidelines that he believes can help identify and describe competencies from your data.

Focus on generic competencies. If you keep your competencies broad and generic rather than specific and situational, your list will get greater acceptance by more jobholders.

Avoid the obvious. Some competencies should be taken for granted and not listed, especially if they were conditions met be every entry-level employee.

Behavior must be observable and measurable. Avoid statements like "must have an appreciation of the importance of our customers" or "requires and understanding of the profitability of our four major services".

Illustrate with behavioral examples. Pinpoint the behaviors that demonstrate what you mean. Spell out these specific behavior examples.

Use familiar language. It is better to use simpler labels that are understandable to everyone.

Keep it short. Most competency studies produce lists of about a dozen competencies. Generic lists may go to 20.

Keep competencies mutually exclusive. Some competencies may look similar, but define them so that they do not overlap.

Focus on future needs. HR research often focuses on things needed to do jobs as they exist today. However, competencies are used to assess and train people for tomorrow.

Work backward, from results to behavior competencies. When beginning with results, behavior competencies can be tracked often after peeling away several layers of the problem.

Define levels of excellence. Once a competency has been defined, give illustrations of behavior that is expected of a professional performing at a high level.

Avoid personality traits. Many personality traits cannot be improved through training. If you believe that certain traits are critical to success on the job, put them on a separate list.

Cluster similar competencies. A list of competencies is more useful to job holders and their managers if similar competencies are grouped under broad headings.

This is a comprehensive list of "best practices" for the practical portion of developing core competencies. Most of the literature available on competency models addresses these points, but Parry's article was the first to assemble them in a single comprehensive list. By analyzing the data and following these guidelines, the interim competency model is created.

The final phase in the creation of the competency model is validation. At this point, the model may look comprehensive, but it cannot be deemed as complete until it is validated. Most companies that undertake competency modeling validate the model through a process called 360-degree feedback. 360-degree feedback is a method that collects data about an individual's performance from the subject, his or her bosses, colleagues, subordinates and customers. Although only 8 percent of major companies now are using multi-source assessment, 69 percent plan to introduce it in the next 3 years (Debare, 1997, p. 1) Many think it provides a more comprehensive and accurate picture of behavior than traditional downward feedback from only a boss (Lepsinger, 1999, p. 125). Data from the competency model is converted into a questionnaire that is then distributed to the jobholder and those around him or her. Those "stakeholders" then judge, usually on a 1 (never) to 5 (always) sliding scale, if the individual uses each of the

specific behaviors (competencies) outlined in the survey instrument. When the results are tabulated, a statistical analysis is then done to determine which of the competencies are valid based on the outcome of those surveyed. At this point, some minor adjustments may be necessary to the competency model based on the new data, but for all practical purposes the competency model can then be considered complete and valid.

E. SUMMARY

The literature areas that were addressed provided a framework that should prepare the reader for the analysis of the data. A review of TRADOC Pam 350-70 focuses on the analysis, design and development of Army courses. In particular the SAC course which trains the Army's FA 53 officers. From there, the Clinger-Cohen Act mandated the creation of the CIO position. In turn this created a need for a list of core competencies for CIO's for which the CIO University concept was created. Finally, core competencies and competency modeling were broken down to provide a deeper understanding of the competency model process.

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III. METHODOLOGY

A. INTRODUCTION

1. Research Focus

> The strategic goals and objectives of an organization and the results of a front-end needs analysis, assessment, and planning project are the inputs to, and drive the competency model development stage of, creating a competency-based performance improvement system. (Dubois, 1993)

Those in industry and government are beginning to realize the importance of competency models. This has led to the use of competency models not only for defining the knowledge, skills and attributes an individual needs to excel at his job, but to the understanding of the importance of integrating the competency model into all personnel decisions.

An example of this can be found at the Civilian Personnel Office (CPO) where they have contracted that a competency model be developed for their information managers (CP-34) in order to achieve their organizational goals by leveraging information technology. The Army must address the strategic need of our system automation management officers by making them a vital part of the Force XXI process. Failures to do so would result in the inability to leverage technology to achieve information dominance of the battlefield.

2. Research Approach

Competency models are not new to the federal government. In the early 1970s the United States Information Agency (USIA) enlisted the help of David C. McClelland

to identify the attitudes and habits of outstanding USIA officers. (Lucia, 1999) Over the years, the method of developing competency models has evolved into five basic methods:

1. Job Competency Assessment Method.
2. Modified Job Competency Assessment Method.
3. Generic Model Overlay Method.
4. Customized Generic Model Method.
5. Flexible Job Competency Model Method.

While each model is different in the approach to building it, each method produces the same result: a competency model that identifies knowledge, skills and attributes required for successful job performance.

For this study we chose the Customized Generic Model Method to develop a competency model for the FA 53 officer. This method was chosen due to the extensive competency studies conducted by the federal government and the large number of proprietary companies that specialize in competency modeling for information technology managers. By following the steps of the customized generic model method we will derive a competency model for FA 53 officers.

The steps for using the customized generic model method include the following:

1. Enlist client or group support and develop a project plan.
2. Assemble and review all available information pertinent to the job.
3. Research an initial set of job competencies and identify performance criteria for success in the job.
4. Organize a focus group.
5. Convene the focus group and develop a draft competency model.

6. Finalize and validate the competency model.

7. Provide the final project results and products.

B. COMPETENCY DEVELOPMENT PROCESS

Step 1. Enlist client or group support and develop a project plan.

The active involvement of the leadership of the organization is required at every step in the competency model development. Without active participation and the concurrence of the organization on the final project products, the acceptance and use of the competency model will be low. Also a detailed project plan addressing project steps, work requirements, and project output/outcomes must be developed.

Step 2. Assemble and review all available information pertinent to the job.

There is no such thing as too much information in this step. As much information as possible about the job must be gathered. Items like job descriptions, job outputs, organizational environment and other pertinent information must be researched. Once the information is collected it should be placed into an information document and distributed to the focus group.

Step 3. Research an initial set of job competencies and identify performance criteria for success in the job.

Search for a competency model or a set of competencies that you feel closely match the job and competency model you are developing. Once a validated model is

found you must determine whether the model can be used and what the copyright conditions are.

Step 4. Organize a focus group.

The composition of the focus group is important to the acceptance of the completed model. Focus group members should include but are not limited to: senior managers, subject-matter experts, personnel managers, and top job performers in the organization.

Step 5. Convene the focus group and develop a draft competency model.

The project manager provides the focus group with the project plan, explains work outputs that need to be completed, explains competency model products, presents a timetable for completion of the project, and explains the importance of the project to the organization. The focus group provides input and develops a draft, "best estimate" competency model.

Step 6. Finalize and validate the competency model.

The purpose of this step is to finalize the competency model developed by the focus group. The more comprehensive the model is, the more useful it will be for defining the skills, knowledge and attributes the organization expects in this job.

The method of validation depends on the time and resources available to the focus group. Normally a survey is conducted that includes: data collection procedures and forms; an analysis plan, and other elements required to produce survey outcomes.

Step 7. Provide the final project results and products.

At the end of the research and analysis phase a competency model is complete. The organization will be provided with information documents that describe the development process and the implementation procedures for the competency model.

In conclusion, following the steps in the customized generic model method will produce a validated, organizationally accepted competency model for a specific job.

C. COMPETENCY-BASED TRAINING AND DEVELOPMENT

Competency-based training and development activities include formal training programs; development center feedback; self-development resources guides; computer and interactive video-assisted self instruction; job assignments; mentoring relationships; organizational structure, process and culture intervention designed to increase an individuals competence. (Dubois, 1993)

There are seven steps in developing a competency-based training program:

1. Develop a competency model.
2. Identify which competencies are the most cost-effective to train versus which competencies to select for.
3. Select the most cost-effective development options.
4. Develop assessment methods and training curricula.
5. Train trainers.
6. Train leaders.
7. Evaluate training results.

A validated competency model will provide the core competencies needed for superior performance in a job. And while most people would agree the core competencies and traits could be trained, it might be more cost-effective to hire a person that possesses these competencies instead of train someone who doesn't possess them. Personnel evaluations will address the competence areas that an individual needs to focus their individual training efforts. Finally a formal evaluation process will ensure the competency model and follow on training programs support the organization's strategic vision.

IV. DATA ANALYSIS

A. COMPETENCY DEVELOPMENT PROCESS

Step 1. Enlist client or group support and develop a project plan.

This thesis arose from a search for guidance on elective slots in the Naval Postgraduate School ITM curriculum that would prepare us for our next job. First, we called the SAC director, and asked for course of study guidance and were told to follow the SAC matrix. While the SAC matrix was a step in the right direction, most of the topics were already covered in the ITM curriculum. We were looking for more job specific guidance to prepare us for our next assignments. Next, we contacted other FA 53 officers in various job at Fort Gordon. Examples of other guidance we received are: focus on hard skill hands on learning; take courses in AI, systems security, computer graphics, interactive computer systems, expert systems, robotics, image synthesis, computer animation, virtual worlds and simulation systems, security policy models and formal methods. In general this guidance was too broad and provided little help. There were too many topic areas to fit in to a few elective slots. We were still left wondering "What should a FA 53 Officer know when he/she reports to their next job?"

With a lack of solid guidance we chose to find and develop our own curriculum. In November 1999 we spoke with Mr. Philip Sines, Chief of the Officer Division, United States Army Signal Corps and Fort Gordon (USASC & FG), about sponsoring a curriculum at the Naval Postgraduate School. He welcomed the idea of sponsoring a curriculum and solicited any information or feedback we could provide to the FA 53 community because USASC & FG was working on OPMS XXI guidance and FA 53 job

requirements. Later we spoke with our assignments officer and he iterated that the PERSCOM community would also be interested in the outcome of this thesis research.

Step 2. Assemble and review all available information pertinent to the job.

We assembled and reviewed data from the following sources: DA Pam 600-3, Commissioned Officer Development and Career Management, ACS curriculums, and the SAC curriculum. During our information gathering process we noticed three distinct competency areas that a FA 53 officer should possess: Leadership, Management, and Technical. We used these three areas to break down the unique functions performed by Information Systems Management Officers as defined by DA Pam 600-3 (Appendix A).

a. Leadership

- Advise commanders and staff on computer information systems policy and technical matters.
- Perform economic analysis, and plan, program and budget for information systems resource requirements (equipment, people and facilities).
- Establish and prioritize computer systems goals and objectives at various levels.

b. Management

- Develop and conduct customer education programs.
- Manage computer information systems resources, maintenance programs and logistics support.
- Supervise automated information processing for units, installations and activities.

- Plan and manage the integration of hardware, software and data communications at the user interface level.

- Supervise the installation, operation and administration of all computer systems and local area networks at all organizational levels to include multinational, joint and Service agencies.

- Develop and coordinate procedures for contingency operations during system emergencies, outages, degraded operations, or downtime for maintenance.

- Establish procedures for effective and efficient use of computer systems resources.

c. Technical

- Translate mission needs into computer systems requirements and help to define functional requirements.
- Evaluate and optimize efficiency of computer network resources.
- Develop and implement procedures for the local procurement, storage, distribution and control of commercial computer system products.
- Develop, implement and manage data base management systems and local area networks.
- Write and maintain accreditation plans for computer systems.
- Develop and manage information security procedures.
- Configure and maintain firewalls; provide networking security.
- Design and maintain the installation of web sites.

Step 3. Research an initial set of job competencies and identify performance criteria for success in the job.

The next step was to study a set of validated competency models. We looked at four validated competency models.

1. CIO Competency Model (Parker, 1999, pp 9-30)
2. I/T Competency Model (Slaughter, 1998, pp 1-14)
3. Office Technical Liaison (Lepsinger, 1999, pp.168-172)
4. Generic Competency Model for Manager (Spencer, 1999, pp. 201-212)

During our research we started to eliminate competency models one by one until we found a model that best represented the balance between leadership skill, management skills, and technical skills. The first model we eliminated was the CIO competency model. This model addressed the right managerial and technical skills but was focused at too high a level of responsibility. The CIO University focuses on competencies for the senior federal executive/senior officer level. Our competency research is focused at the company grade officer level.

The next model to be eliminated was the Officer Technical Liaison. This model provided a good look at the technical skills a FA 53 officer needs to provide technical support to his/her customers. The down side of this model was the lack of leadership and management skills. It focused more on tasks performed by a technical worker versus a technical manager.

Finally we eliminated the Information Technology competency model. This model provided a great balance between the managerial and technical skills the FA 53 officer should posses. However, as the model was "peeled back" to look at specific technical skills the model contained too many proprietary nuances. We also were not able to verify the validation process that the Gary Slaughter Company used to develop this model.

This left the Generic Competency Model of Managers. Spencer's research with the Job Competency Assessment (JCA) method and his focus on the different types of managers, to include managers in the armed forces, separated this model from the others. Spencer suggests that the basic competency model for all managers is the same. The differences are in the emphasis on the different competencies based on the job duties and work environment. The author contends that leadership and developing others are more important competencies in the military environment (Spencer, 1993, p. 219).

Armed with the Generic Competency Model of Managers, we looked at areas to modify the model to meet the specific needs of the FA 53 community. Early feedback from the FA 53 branch indicated a need to look at project management skills in addition to the obvious technical skills. To do this we looked at competency models for project managers. We selected items from the Competency Model for Professional Project Managers (Project Management Partners, 1999). The key was to control the scope of project management for a FA 53 officer. Finally we looked at the technical skills that needed to be added to the competency model. This was accomplished by analyzing the curriculums for SAC and ACS schools. Instructors at SAC provided us with the basic curriculum and training. For ACS we looked at the curriculums from the nine most attended schools for FA 53 officers over the last five years.

Based on our research and initial guidance from the FA 53 community we modified the Generic Competency Model of Managers into a draft Information Systems Management Officer Competency Model. The italicized headings are the competencies we added/modified from the generic model. The competency model provided to the focus group is in Appendix B.

Step 4. Organize a focus group.

We organized a focus group of senior officers and civilians responsible for training, educating and managing FA 53 officers from the Information Operations Career Field. All of these FA 53 officers have completed at least two years of an initial branch qualifying FA 53 job. The focus group consists of the following personnel:

1. Mr. Philip Sines - Chief Officer Division, USASC & FG
2. Mr. Pete Phelps - Training/Force Integration, USASC &FG
3. MAJ Alan Makowsky - Functional Area 53, USASC & FG
4. MAJ Steve Bakum - Director SAC
5. MAJ Tim Reaves - Chief (Acting) Officer Training Division
6. LTC Nelson McCouch - Functional Area 53 Branch Chief
7. MAJ Lance Lombardo - FA 53 Field Grade Assignments Officer
8. MAJ Vince Wallace - FA 53 Company Grade Assignments Officer
9. LTC Jody Draves - Branch Chief Information Operations Career Field

Step 5. Convene the focus group and develop a draft competency model.

Due to the time and monetary constraints of bringing the members of the focus group to one location this step was modified to facilitate completion of this thesis. First we developed a draft competency model by modifying a validated competency model. Next we contacted each member of the focus group via e-mail and/or telephone and provided them with a copy of the rough draft competency model. Finally we asked each member to review the competency model and provided feedback and general comments. This modified research step allowed input/comment from users, trainers, and managers of FA 53 officers. The most important outcome of this step is the refined competency model.

Step 6. Finalize and validate the competency model.

Due to the extensive interview and questionnaire collection required by the 360-degree feedback process we were not able to validate the Information Systems Management Officer Competency Model. This is an area that we recommend for further research and study. This validation process will also require a strong command emphasis from the USASC & FG community as well as PERSCOM in order to ensure prompt input from interview and questionnaire personnel.

Step 7. Provide the final project results and products.

The findings and recommendation of this thesis will be provided to USASC & FG, SAC, PERSCOM, and NPS faculty.

B. COMPETENCY-BASED TRAINING AND DEVELOPMENT

Step 1. Develop a competency model.

This research is outlined above.

Step 2. Identify which competencies are the most cost-effective to train versus which competencies to select for.

In the selection process to assign officers into FA 53 the Army tries to get officers with degrees in computer science or electrical engineering backgrounds. However, in the end the two main driving factors in the assignment process are the officer's preference and the needs of the Army. The FA 53 community feels it can train the selected FA 53 officers with the competency skills he/she will need.

Step 3. Select the most cost-effective development options.

The Army selects approximately 30 officers annually to serve in the FA 53 community. Of this 30 selected roughly nine attend ACS. The rest of the officers are sent to SAC to receive technical training. The end result is that the Army provides training at either SAC or ACS in order to ensure competency training for FA 53 officers is completed.

Step 4. Develop assessment methods and training curricula.

In this section we will assess the training curricula currently taught at SAC and the eight most frequently used ACS programs. Note that the training assessment conducted at SAC is based on the TRADOC Systems Approach to Training. Currently there is no formal training assessment conducted of the ACS programs.

To do this we took the common technical competencies and matched these competencies up to the SAC curriculum (Figure 4.2). Overall SAC does a god job addressing all of the technical competencies of the competency model. However, you will notice that the shortfall of SAC is that it does not address any project management training.

System Automation Course Curriculum

Course	*Length*	
Networking Essentials	5	Networking and Data Communications
NT Server 4.0	6	
NT Enterprise	5	
Routers	4	
IP Management	3	
TCP/IP	3	
Messaging	2	
Web Concepts	11	
Database Design	9	Databases
Computer Hardware	3	Architecture and Operating Systems
Solaris Administration	5	
Operating Systems	3	
Programming	20	Programming and Software Engineering
System Analysis and Design	5	System Analysis and Design
Network System Security	8	Security

Figure 4.1 System Automation Course vs. Technical Competencies

The director of SAC has already indicated that project management training will be added to the SAC curriculum in the near future. This ability to react to the rapidly changing technology environment is the real strength of SAC. Because of its relatively small size and the use of the TRADOC Systems Approach to Training, SAC is able to address training shortfalls and makes quick curricula changes.

A look at the Army's ACS program provides a stark contrast to the small, flexible SAC curriculum. The Army uses no less than eight different universities to train FA 53 officers. Each school has a different curriculum. For some schools the Business Administration department manages the ITM curriculum while the Computer Science department manages others. The bottom line is that is no standard or guidance to these

universities or to the officers attending these schools as to what knowledge/skills that should be taught in order to possess technical competencies.

In this research, we evaluated the eight schools that have been attended the most over the last five yeas. The number in parenthesis indicates the number of students that have attended that school.

1. Naval Postgraduate School (38)
2. University of Central Florida (11)
3. University of Florida (3)
4. College of William and Mary (3)
5. Texas A & M (4)
6. Northwestern (6)
7. George Mason (3)
8. University of Maryland - College Park (3)

Since the majority of FA 53 officers attended the Naval Postgraduate School, we chose to use it as a core curriculum that trained all of the technical competencies. Using this core curriculum, we then compared the ITM curriculum from each school to determine if their program trained the competency skill. If the school taught a course that trained the competency skill they were given the value of "1", if the school did not teach the competency skill they were given the value of "0".

	Naval Postgraduate School	Univ. of Florida	Univ. of Central Florida	William And Mary	Tex. A & M	Univ. of Maryland	Northwestern	George Mason Univ.	
Systems Analysis & Design	1			1	1	1	1	1	78%
Computer Networking	1	1	1		1		1		67%
Digital Communication	1	1	1		1		1	1	67%
Database Design	1		1	1	1	1	1	1	78%
Software Engineering	1	1	1	1	1	1	1	1	89%
Decision Support Systems	1			1	1	1	1		44%
Computer Architecture and OS	1	1	1				1	1	67%
Programming Language	1	1	1	1				1	56%
Computer Security	1	1	1	1	1				56%
Software Design	1		1	1					22%
Systems Acquisition	1					1			22%
Information Systems Management	1					1		1	56%

Figure 4.2 Analysis of Core Curriculum

Next we determined which courses were taught at the most schools. We determined that if 50% or more of the universities taught a course then it should remain in the "core curriculum". Courses taught by less than 50% of the schools should be reviewed for removal from the curriculum.

Step 5. Train trainers.

The Army is only able to train the instructors at SAC.

Step 6. Train leaders.

The establishment of the CIO University will focus on education of senior officers and federal employees.

Step 7. Evaluate training results.

At the time of this research there has not been a study sponsored by the FA 53 community to determine the ability of two different schooling options, governed by two different organizations, to provide comparable training for the same job skills.

V. FINDINGS AND RECOMMENDATIONS

A. KEY FINDINGS

This thesis examines the core competencies for FA 53 officers. The objective is to identify the competencies and develop an education program that supports these competencies. To do this we took a critical look at the historical and current programs of study at the Signal Corps' System Automation Course and the Army's Advanced Civil Schooling education program.

While the literature research, interviews and focus groups provided the authors with sufficient information to answer the research questions; the dynamic nature of technology quickly dates this competency model and punctuates the need for frequent updates and modification. The literature search was traditional and provided a firm understanding of the method of competency model development. However, the World Wide Web provided the most up to date technology based competency models.

The Clinger-Cohen Act of 1996 and the formation of the CIO University are complementary efforts by the DoD to address the needs for competency based education and support our findings below.

1. What exactly are the core competencies of the Army's System Automation Officer (Functional Area 53)?

(Consensus) Based on feedback from the focus groups the following modifications to the original competency model were made.

- Leadership

  Applies the dimensions of Army leadership and values

- Developing Others
  No Change
- Initiative
  Is proactive in all matters under his/her control
- Impact and Influence
  Is proficient in both written and oral communication
- Achievement Orientation
  Focused on the customer and their satisfaction
- Teamwork and Cooperation
  No Change
- Analytical Thinking
  No Change
- Self Confidence
  No Change
- Directiveness/Assertiveness
  No Change
- Information Seeking
  No Change
- Conceptual Thinking
  No Change
- Project Management
  No Change
- Technical Knowledge
  No Change

2. Using the core competency model, what are the courses that should be taught in the SAC course and in graduate school which cover all core competencies of the System Automation Management Officer?

A look at the basic timeline for commissioned officers shows how competency education of a FA 53 officer is accomplished. You will notice that many of the competencies are trained at the officer's basic and career branch courses as well as the Combined Arms Services Staff School (CAS3). Others are trained or developed during

the officer's basic branch while he/she serves in the role of platoon leader, staff officer, and unit commander. Finally the officer is sent to SAC or ACS to be trained on the technical competencies of the Information Systems Management Officer Competency Model.

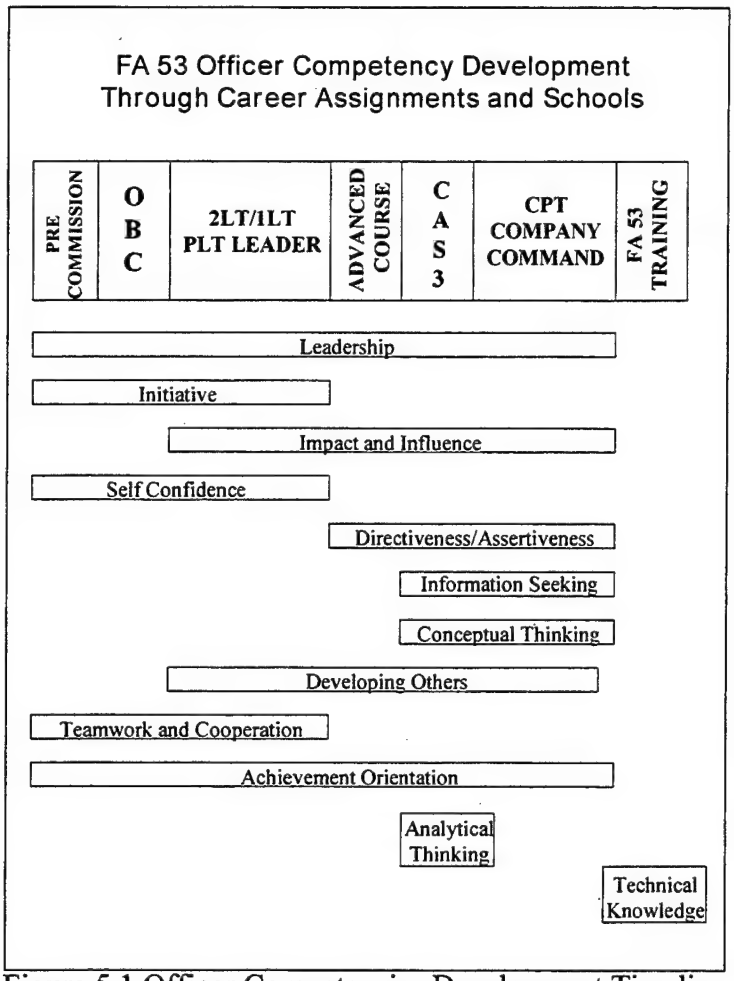

Figure 5.1 Officer Competencies Development Timeline

The Information Systems Management Officer Competency Model provides the knowledge, skills and attributes the system automation management officer should possess. From these knowledge, skills, and attributes an education program is developed that will ensure the officer is prepared to serve as a systems automation professional who can apply his/her knowledge of computing technology and its applications to the

digitization of the US Army. The program of study consists of a computing and information systems based curriculum that provides a foundation in both technical concepts and systems design. The program of study includes:

Information Systems Analysis and Design - This course teaches the tools and techniques of requirements analysis using process-oriented and data-oriented techniques. These methodologies focus on re-engineering, re-structuring, and simplifying work methods and procedures. Topics include: evaluation of alternative design options; cost-benefit analysis; quality assurance; documentation and systems implementation. Rapid prototyping and computer-assisted software engineering approaches are also examined.

Database Design - This course provides knowledge of enterprise-wide data modeling, logical database design, and the management of data resources to support multiple functions. The primary focus is on how data resources are identified, planned, implemented, and merged in order to generate management reports. Topics include: relational database theory; distributed database systems; semantic data models; query processing; transaction management and recovery.

Management of Information Systems Development - This course is designed to focus on planning strategies and the management and control of information systems development projects. It addresses the planning and acquisition of hardware, peripherals, telecommunications equipment and software. Topics include: systems development life cycle; rapid prototyping; use of software packages; and information engineering with data-driven techniques.

Computer Networking - This course teaches structure and architecture of computer networks. The fundamentals of the OSI model are covered as well as examples

of various local area networks. Existing communication protocols are also studied. Topics include: TCP/IP; IP management; routers; packet switching.

Computer Systems Architecture - This course provides an overview of basic computer hardware concepts and operating systems. Topics include: data representation; processor and processor management; memory management; input/output processors and techniques; intra-system communication; microprogramming, parallelism and pipelining.

Software Engineering - This course focuses on the specification, design, testing, maintenance and management of large software systems. Topics included: structured design; structured programming; top-down design and development; segmentation and modularization techniques, iterative enhancement; design and code inspection

Data Communications - This course studies the theory, design and operation of analog and digital communication systems. Topics include: analog/digital conversion; modulation; demodulation; frequency division multiplexing and time-division multiplexing.

Computer Security - This course is intended to provide students with the importance of protecting data in communications between computers-based information systems. It will present security standards, certification, and accreditation standards.

Principles of Programming Languages - This course is an introduction to the design, evaluation and implementation of programming languages. Imperative functional, logic, and concurrent programming methodologies are investigated. Languages to be studied: Ada; C++, Visual basic; Java.

3. How can the Army's FA 53 education system be improved to increase the overall level of education these officers receive?

The changing information needs of the Army and the changing nature of the FA 53 profession itself are factors that dictate a continuing review of the focus of education curricula. The Army must ensure a flexible adaptive process is in place to keep up with the demanding pace of technology. The Army's System Automation Course is right on target with its education program. The small student population and dynamic structure of the SAC allows for frequent curriculum changes to addresses emerging technology. However, the Army's ACS program is not as refined. There are about eight primary colleges and universities used in the education of FA 53 officers. The FA 53 community does not have direct input into the curriculums or courses of study these schools teach. It is our recommendation that the FA 53 community sponsor a Master of Science in Information Technology Management curriculum at the Naval Postgraduate School (NPS). The U.S. Army Modeling and Simulation Office and the Information Operations Officer (FA 30) Personnel Proponent Office already sponsor curriculums at NPS.

INFORMATION SCIENCES, SYSTEMS, AND OPERATIONS CURRICULUM
US ARMY INFORMATION SYSTEMS MANAGEMENT OFFICER OPTION

This curriculum satisfies the requirements for the degree, Master of Science in Information Technology Management

IS 0001 (0-2) is scheduled quarterly for administrative purposes

CI 9xxx courses are temporary letter-numbers for scheduling purposes. They will be replaced with letter-numbers that designate level and department \ group "home" after approval by the academic council. Some IS numbers are also temporary and will be replaced after approval by the academic council. The temporary IS numbers are designated with a (T).

The in-depth study courses must provide a coherent understanding of a significant aspect of Information Systems, Technology, Operations, and and/or their Management.

QUARTER I (Fall & Spring) [14-5]

IS 2020 (T) (2-3) Introduction to Visual Basic
CS 3030 (4-0) Computer Architecture and Operating Systems
OS 3105 (4-1) Statistical Analysis for Technical Management
IW 3101 (4-1) Principles of Information Operations

QUARTER II (Winter & Summer) [14-6]

IS 3020 (3-2) Software Design
IS 3201 (T) (3-2) Fundamentals of Database Technology
IS 3502 (3-2) Computer Networks: Wide & Local Area
OS 3004 (5-0) Operations Research

QUARTER III (Fall & Spring) [14-2]

CC 3000 (4-0) Command and Control Concepts and Practice
IS 3301 (3-2) Fundamentals of Decision Support Systems
MA xxxx (3-0) Mathematics for ISSO and ISO
CS 3600 (4-0) Introduction to Computer Security

QUARTER IV (Winter & Summer) [16-1]

MN 4125 (4-0) Managing Planned Change in Complex Organizations.
CI 9005 (3-0) Communication Systems Technology and Applications
CI 9004 (3-0) Space Technology and Applications

CI 9002 (2-0) C4ISR System Evaluation
IS 4xxx (3-2) In-depth Study Course (*)

QUARTER V (Fall & Spring) [14-4]

IS 4300 (3-2) Software Engineering and Management
EO xxxx (4-0) Communications Systems I
IS 3031(T) (4-0) Principles of Information Systems Evaluation
CI 9003 (3-0) Sensor Technology and Applications

QUARTER VI (Winter &Summer) [10-13]

IS 0810 (0-8) Thesis Research
EO xxxx (4-1) Communications Systems II
IS 4220(T) (3-2) Architecting Information Systems
IS 4182 (4-0) Information Systems Management

QUARTER VII (Fall & Spring) [11-10]

IS 0810 (0-8) Thesis Research
IS 0810 (0-8) Thesis Research
CI 9006 (4-0) C4ISR Systems
IS 4xxx (3-2) In-depth Study Course (*)

(*) Typical In-depth Study Areas

TECHNOLOGY:
Software Engineering
Networks and Communications Systems
Decision Support Systems
Database
Information Assurance
Modeling and Simulation

OPERATIONS:
Command and Control
C4ISR Systems
Information Operations \ Information Warfare \ C2
Operational and System Architectures
Combat Models and Simulations

MANAGEMENT:
C4ISR Systems Evaluation
Acquisition of Information Technology
Systems Analysis and Design Process
Software Engineering Management
Enterprise Management
Information Technology Investment Strategy

B. SUGGESTED FURTHER STUDIES

These suggestions represent areas in which further work would benefit the FA 53 community.

- Complete the validation process for the Information Systems Management Officer Competency Model. Use the 360-degree feedback model IAW the Customized Generic Model Method

- Develop and publish a career education road map for the FA 53 community. This roadmap would address company and field grade branch qualifying jobs, MEL 4 requirements, Ph. D programs and war college requirements.

- Research and define platforms or core technologies the Army plans to utilize to provide information dominance to the battlefield of the 21st century so that

FA 53 officers can receive the training necessary to support those technological advances on the battlefield.

APPENDIX A. DA PAM 600-3 INFORMATION SYSTEMS MANAGEMENT OFFICER DEVELOPMENT

The systems automation management officer manages computer systems and provides automation expertise that all command organizational levels, including commanders and officials and combined, joint, and service agencies; translate vision needs into computer systems requirements and help to define a functional requirements; and is the primary advisor to the commander on automation policy and technical matters. He or she commands and supervises the data processing unit, installations, and activities; forms economic analysis and prepares plans, programs, and budgets for automation resource (people and dollar) requirements; manages automation resource, maintenance programs, and logistical support; and establishes procedures for effective and efficient use of computer system resources. He or she develops and manages local area networks; conducts research, plans, and programs for the life cycle of computer systems enforce modernization needs; establishes and set priorities for computer systems goals and objectives and various levels; and rights and maintains accreditation plans for computer systems. He or she develops and manages security procedures; develops customer education programs; and develops and coordinates per seekers for operation went systems malfunction or operations or degraded or went systems must be shut down for maintenance. He or she also serves as a computer science instructor. Examples of AOC 53A duty positions are automation staff officer; commander, data processing unit; instructor; automation operations officer; automation plans officer; and director, information systems branch.

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APPENDIX B. INFORMATION SYSTEMS MANAGEMENT OFFICER COMPETENCY MODEL

Leadership

- Sets and communicates high standards
- Develops vision and creates strategic IT plans
- Applies the dimensions of Army leadership and values
- Stands up for the team
- Resources the team

Developing Others

- Have positive expectations of others
- Gives constructive feedback
- Encourages subordinates/team members after difficulties
- Coaches by giving instructions, suggestions, explanations, and support
- Gives specific developmental assignments or training

Initiative

- Seizes opportunities and prepares for future opportunities
- Handles crises swiftly
- Exceed the bounds of one's formal authority
- Exhibits tenacity and persistence when pursuing a goal

Impact and Influence

- Establishes credibility and makes specific impression on others
- Calculates the effects of words/actions on others
- Concerned with personal credibility and impressions they wish to convey
- Uses various means of direct persuasion

Achievement Orientation

- Measures performance and discusses same
- Sets goals and strategy
- Conducts cost/benefit analysis
- Take calculated risks
- Continuously finds better/faster/more efficient ways of doing things

- Uses interpersonal understanding to make optimal job-person matches

Teamwork and Cooperation

- Solicits input of others and involve them in decision making
- Give credit and recognition to subordinates
- Empowers the group and individuals
- Improves group morale, teamwork and cooperation
- Conducts conflict resolution

Analytical Thinking

- Thinks logically and sequentially
- Analyzes situations systematically to determine causes/consequences
- Anticipates risks and performs risk management
- Conducts process management and analyzes what it takes to accomplish the task

Self Confidence

- Exhibits confidence in ability and judgments
- Enjoys challenging tasks
- Possesses the ability to challenge or question institutional norms
- Takes failures personally with the intention of improving performance

Directiveness/Assertiveness

- Assertive in setting limits and saying no
- Sets the example and demands performance
- Confronts others performance problems in a clear and direct manner

Information Seeking

- Gathers information systematically
- Seeks information from many sources
- Stays abreast of emerging technologies and their directions
- Physically gets out to see or touch the situation

Conceptual Thinking

- Sees connections or patterns that are not obvious to others

- Notices inconsistencies/discrepancies not obvious to others
- Rapidly identifies key issues in complex situations
- Uses vigorous, original analogies or metaphors

Project Management

- Uses available planning tools effectively
- Document and distributes project plan; uses plan to manage project
- Actively manages project status on performance, cost and schedule
- Conducts regular project review meetings
- Encourages communication within the project
- Gets the team actively involved in the planning effort

Technical Knowledge

- Understands networking designs, architecture and planning
- Capable of performing analysis and design of a system
- Understands principles and applications of databases
- Understands system architecture
- Understands the various software engineering processes
- Knows a programming language
- Understands the various data communication methods
- Can apply the principles of computer security
- Demonstrates the ability to manage information systems

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